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NOTES AND COMMENT

BEHAVIOR OF LOON AND SARDINES

While working on the outer end of our pier, about 1000 feet from shore, at 7.50 a.m. December 29, 1919, my attention was attracted to a small school of small sardines (*Sardinella coeruleus* Starks and Morris) quite conspicuous in the moderately clear water. The little fish seemed to be badly frightened. The school was very compact and was in the form of a symmetrical ball approximately six feet in diameter. The general course of movement was very regular but mainly toward the northwest and at an average depth of about ten feet. From 7.50 to 7.55 it was within a distance of twenty-five feet from the pier in a remarkably good position for observation.

Shortly after the school was noticed, a large loon (*Gavia immer* Brünnich) was seen about five yards distant resting at the surface. The loon dived and dashed toward the fish, swimming with feet only, the wings being held tightly against the body. The sphere of fish indented like a hollow rubber ball at the point of attack, then scattered slightly, coming together again into a sphere as the bird passed to the other side. The loon made several rushes at the sphere before coming to the surface for air. At one time it came up toward the middle of the school from below. The school spread into an almost perfect circle through the center of which the bird swam.

Most tries were made by dashes at the sides of the sphere. After coming to the surface the loon almost instantly thrust its head under, then dived soon after. Six or eight under water trips were made by the loon while still close enough to be plainly seen. Apparently no fish were caught at any time. Swimming was entirely by the feet in every case. Sometimes the bird made one look below the surface before diving, at other times two or three looks. The school of fish stayed in about the same spot for five minutes.

At the time that the performers in this drama of life drifted from sight there was no evidence that the loon had made a single catch. One might suggest the possibility that the bird was unable to make a choice amongst so many chances before his opportunity was gone. Members of the Station staff have noticed on other occasions the symmetry of form of small schools of sardines, the perfect coordination of movement in evolutions of the school whether in avoiding objects or in leisurely change of direction, and the tendency to instant re-formation when unavoidably scattered by several enemies. Dr. W. E. Ritter raises the question as to whether these group movements of sardines may not be protective adaptations in behavior, useful through confusing enemies by distribution of individuals equidistantly from the point of danger in a symmetrical figure.—W. E. ALLEN, *Scripps Institution for Biological Research of the University of California, La Jolla, California.*

BEHAVIOR OF FEEDING MACKEREL

On September 6, 1920, at 8.15 a.m., I was engaged in taking a daily plankton collection at the outer end of the pier. While so occupied I noticed a mackerel (*Scomber japonicus* Houttuyn) of about one pound weight, dashing through the water with a freshly caught sardine (*Sardinella coeruleus* Starks and Morris) of about three inches length, held crosswise in its mouth. In a moment other mackerel were seen rushing from all sides toward the one which had made the capture. They snatched at the projecting ends of the sardine and in an instant the water was aboil with mackerel fighting over the broken bits of dismembred prey. The general scuffle and scramble was somewhat similar to that of chickens about a captured worm, or gulls about a stolen fish, but there was much more of an appearance of reckless ferocity.

Flurries such as that caused by this group had been frequently seen near the pier during the first week in September, but in no other case had it been possible to see the beginning of the contest. Since there were many sardines in the water all about this group of mackered, and since enormous numbers had been seen in the areas of similar flurries, it seems fairly clear that mackerel as well as many other anmals will not work for or hunt for their own food if there is any possibility of robbing a neighbor.

In this connection it is worth while to remember that the exquisitely coordinated movements of a school of sardines seem baffling to mackered and sharks in the same way as it seemed to be in the case of a loon described in the foregoing note. Apparently a conspicuous sardine would be instantly selected for slaughter. All hope of survival seems to lie in rigid conformity to type. Does any one know whether such fishes as sardines are less variable than are the predatory fishes?—W. E. ALLEN, *Scripps Institution for Biological Research of the University of California, La Jolla, California.*

THE NATIONAL PARKS

The Ecological Society fully realizes the need of preserving natural areas for scientific and educational purposes; this means not only setting aside new areas but keeping intact those already reserved. We already have in the United States nineteen National Parks and a larger number of National Monuments in which, for the most part, natural conditions prevail. These wild regions, some of them set aside many years ago, are as yet practically untouched and are, in fact, nature museums. Scientific men, more than any others, are interested in the effort to protect these parks from